

## NOVEL CANTILEVER DESIGN FOR ATOMIC FORCE MICROSCOPY

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The sensitivity of atomic force microscopy (AFM) is limited by cantilever stiffness. Soft cantilevers can measure small forces, but have low bandwidth and hence are noisy at low frequencies. A cantilever with a high resonant frequency is necessary in order to achieve reasonable scanning speeds and it has a lower noise density. The established method for fabricating sensitive cantilevers has been to increase the beam length, keeping the thickness constant. This decreases the signal-to-noise of the system and reduces its resonant frequency. We have taken a different approach, making a short, 0.2-0.5  $\mu\text{m}$  thick,  $\text{Si}_3\text{N}_4$  hinge region and decreasing the beam length. This allows fabrication of a cantilever beam with a low spring constant and high resonant frequency. The smaller lever arm increases the sensitivity of optical detection methods and when scanning in fluids, the smaller moving surface area reduces the amount of viscously coupled water, the most significant mass. The rectangular-beam cantilevers have spring constants ranging from 0.04 to 0.001 N/m.

